

ANEXO 5

Informe **"Gap Assessment of the AGIES of the Valdivia River Basin"** ("Evaluación de Deficiencias del AGIES de la Cuenca del Río Valdivia"), elaborado por el señor **Dan Zilnik**, director de la empresa consultora canadiense Oil & Gas Sustainability Ltd. (en su versión original en idioma inglés y su traducción libre al español), acompañado en proceso de reclamación Rol R-25-2016, caratulado "Corporación para el Desarrollo de la Región de Los Ríos con Ministerio del Medio Ambiente", que también complementa el Anexo 2 por cuanto sus principales conclusiones mantienen vigencia en relación con el AGIES del Anteproyecto.

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GAP ASSESSMENT OF THE AGIES OF THE VALDIVIA RIVER BASIN

Submitted to: Celulosa Arauco y Constitucion S.A. (ARAUCO)

Prepared by: Oil & Gas Sustainability Ltd.

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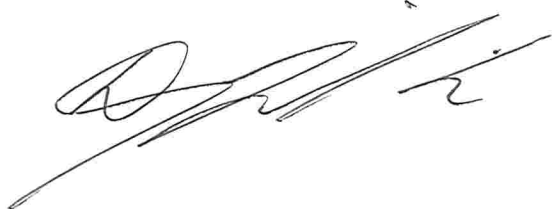
Oil & Gas Sustainability Ltd. (O&G) is a boutique consultancy whose mission is to help leaders in the extractive sector(s) make distinctive, lasting, and substantial improvements in sustainability performance, which strengthen the entire business.

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DISCLAIMER

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This report was prepared based on a combination of factual documented information, knowledge, experience, interviews and from learning and insights. All reasonable effort has been taken to ensure the correctness and accuracy of the contents. Oil & Gas Sustainability Ltd. cannot warrant the accuracy of personal knowledge, experience and opinion, nor the results of any further interpretation and translation of the information in this report.



Date: 24 February 2016

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1. EXECUTIVE SUMMARY

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I. Context for this Report

Celulosa Arauco y Constitucion S.A. (ARAUCO) owns and operates five pulp mills in Chile, one in Argentina, and jointly operates one in Uruguay. One of these pulp mills in Chile, in operation since 2004, is located in the San José de la Mariquina county, Región de Los Ríos, Chile (the Valdivia Mill). The Valdivia Mill discharges its treated effluents in to the Cruces River, part of the Valdivia River Basin. According to Chilean regulatory requirements, an economic opinion is required before the government enacts an environmental quality standard. The Chilean Ministry of Environment provided such an economic opinion through Memorandum No. 210/2013, dated December 2013, (the AGIES)¹ for *The Secondary Water Quality Standard for the Valdivia River Basin* (NSCA).² The NSCA was published in the Official Gazette in December 2015. The new requirements for the NSCA and the AGIES are provided in the *Regulation on the Issue of Environmental Quality and Emissions Standards* (D.S No. 38/2013).³

ARAUCO has expressed concerns regarding gaps in the AGIES and filed an official objection to the NSCA on January 6, 2016. ARAUCO's official objection includes four primary objections, one of which is that there is "no identification and consideration to the effective economic and social costs that will be produced from the secondary norm of environmental quality contained in the Decree Challenged", which is further elaborated; "the AGIES does not fulfill the minimum legal requirements..."⁴

II. Scope and Findings

The objective of this assessment is to evaluate the completeness of the AGIES based on requirements described in D.S No. 38/2013 Article 15, titled "On the technical and economic analysis". A secondary objective is a determination of the quality of the AGIES. This quality assessment is conducted through an assessment of the AGIES relative to best practices. Therefore, the assessment of the AGIES has been completed from three perspectives:

1. Gaps relative to regulatory requirements described in Article 15 of D.S No. 38/2013;
2. Gaps relative to socio-economic impact assessment best practices; and,
3. Gaps relative to cost-benefit analysis best practices.

The key finding of this assessment is that that the current AGIES contains gaps relative to the regulatory requirements as outlined in Article 15 of D.S No. 38/2013. The current AGIES also contains gaps in socio-

¹ León, Jorge M. et al. *General Analysis of the Economic and Social Impact of the Valdivia River Secondary Water Quality Standard* (English Translation). N.p., 2013. Print.

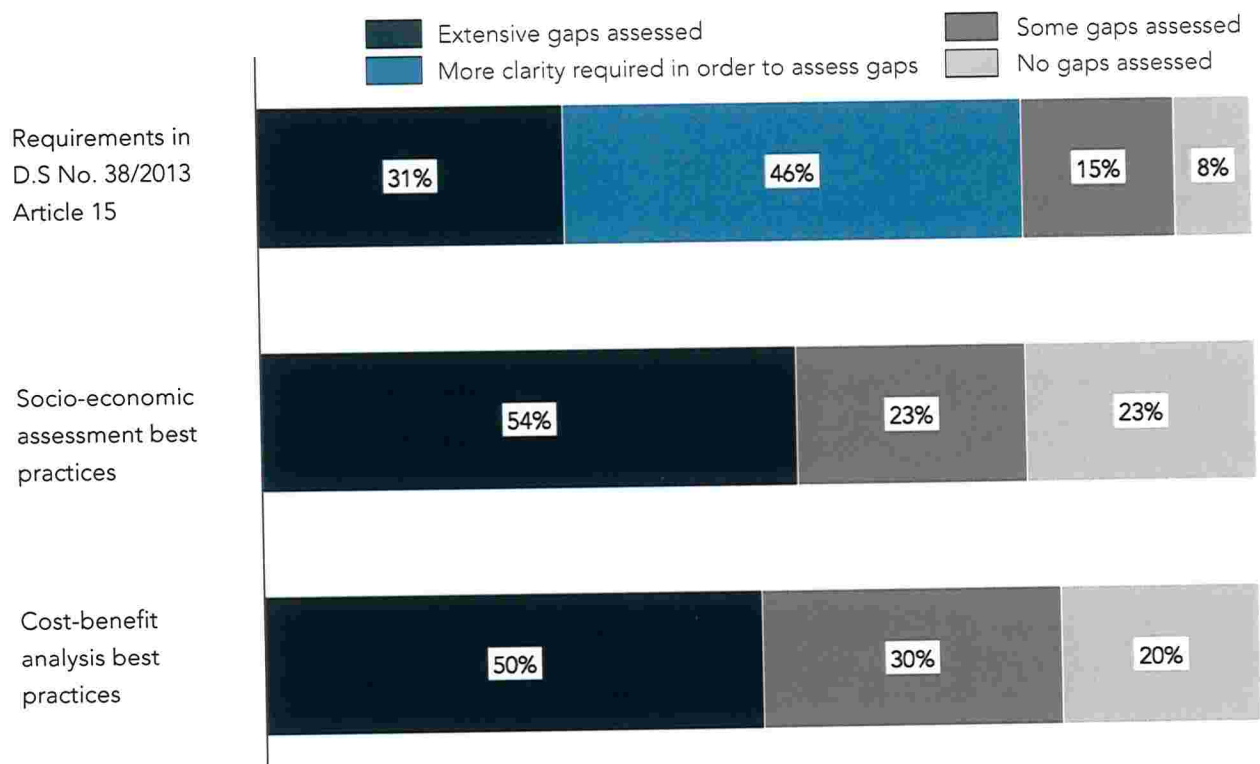
Republic of Chile Ministry of Environment. *Establishes Secondary Water Quality Standards for the Valdivia River Basin* (English Translation) (2015): N.p., Print.

Republic of Chile Ministry of Environment. *Regulation on the Issue of Environmental Quality and Emissions Standards* (English Translation). N.p., 2013. Print.

⁴ Reclamación R-25-2016, Tercer Tribunal Ambiental. *Reclamación del artículo 50 de la Ley No. 19.300* (Translated by Oil & Gas Sustainability). p 5. 2016. Print.

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economic impact assessment best practices and cost-benefit analysis best practices. The figure below outlines these gaps further.



- Article 15 of D.S No. 38/2013 contains 13 relevant required criteria. One of 13, approximately eight percent, of the requirements is fully met. The required criterion that is fully met involves understanding the costs of applying the secondary standard for the State, and approximately 15 percent of the other required criteria regarding understanding costs are met, but with some gaps. The AGIES contains extensive gaps regarding the evaluation of benefits and risks, and makes assumptions that benefits cannot be quantified. This results in the majority of required criteria (approximately 77 percent) either containing extensive gaps or requiring more clarity in order to assess gaps.
- Socio-economic impact assessment best practices are based on Burdge’s *A Community Guide to Social Impact Assessment*. Approximately 23 percent of relevant best practices are used in the AGIES, including a thorough description of the proposed action, a well-delineated zone of influence and a description of methods. Approximately 23 percent of socio-economic best practices are used with some gaps through the identification of some stakeholders, the identification of some community and institutional impacts and through a description of proposed incremental monitoring. The majority of relevant socio-economic best practices, approximately 54 percent, contain extensive gaps.
- Cost-benefit analysis (CBA) best practices are based on Snell’s *Cost-benefit Analysis: a practical guide*. Based on this guide, 20 percent of CBA best practices are used including defining the decision to be guided by the CBA, and defining the assessment as being framed from the State’s perspective. In addition,

20 percent of CBA best practices are used with some gaps including a partial explanation of criteria and partial calculation of incremental costs. Half, 50 percent, of CBA best practices contain extensive gaps. These extensive gaps include a calculation of costs of abatement and monitoring but no calculation of benefits making a discounted net benefit/cost calculation unfeasible.

III. Conclusions

The Gap Assessment of the AGIES of the Valdivia River Basin finds that:

- There are gaps relative to required criteria as stated in Article 15 of D.S No. 38/2013. The majority of required criteria (approximately 77 percent) either containing extensive gaps or requiring more clarity in order to assess gaps.
- There are gaps relative to both socio-economic impact assessment best practices and cost-benefit analysis best practices. In the case of socio-economic impact assessment best practices, extensive gaps are assessed in approximately 54 percent of best practices. In the case of cost-benefit analysis, there are extensive gaps assessed in 50 percent of best practices.

IV. Proposed Next Steps

ARAUCO's official objection to the NSCA, dated January 6, 2016, requests that:

*"...the Ministry of Environment to issue a new resolution to initiate a new process for the secondary environmental quality norm in the Valdivia river basin, which allows the appropriate consideration of the existing technical and scientific studies and to elaborate an ideal Official Draft for the protection of the waters in the basin."*⁵

This request notes that a secondary standard should be based on the most appropriate scientific and technical information possible. Based on this perspective in ARAUCO's official objection, some next steps are proposed. These next steps are envisioned as actions for ARAUCO only. Suggested next steps for ARAUCO are:

- Share the findings of this gap assessment with relevant identified staff in the Republic of Chile's Ministry of the Environment. These findings can be used to establish a shared understanding of the nature of gaps in the AGIES.
- Establish a plan to close gaps in AGIES. One option is for ARAUCO to hire a credible third party to undertake an assessment using the AGIES requirements and best practices, and develop a more updated AGIES that meets the needs of both the requirements of Article 15 of D.S No. 38/2013 and uses best practices. This updated AGIES can be presented to the Republic of Chile's Ministry of Environment as a point of comparison to progress a shared understanding on the social and economic impacts of the NSCA.

⁵ Reclamación R-25-2016, Tercer Tribunal Ambiental, Reclamación del artículo 50 de la Ley No. 19.300 (Translated by Oil & Gas Sustainability). p 6. 2016. Print

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2. BACKGROUND

Celulosa Arauco y Constitucion S.A. (ARAUCO) owns and operates five pulp mills in Chile, one in Argentina, and jointly operates one in Uruguay. One of these pulp mills in Chile, in operation since 2004, is located in the San José de la Mariquina county, Región de Los Ríos, Chile (the Valdivia Mill). The Valdivia Mill discharges its treated effluents in to the Cruces River, which is part of the Valdivia River Basin. According to Chilean regulatory requirements, an economic opinion is required before the government can enact a water quality standard. In December 2013 the Chilean Ministry of Environment provided their economic opinion by issuing Memorandum No. 210/2013, and providing the *Análisis General de Impacto Económico y Social* (the AGIES) into the public file.⁶ The AGIES is of *The Secondary Water Quality Standard for the Valdivia River Basin* (NSCA),⁷ and the NSCA was published in the Official Gazette in December 2015. The new requirements for the NSCA and the AGIES are provided in the *Regulation on the Issue of Environmental Quality and Emissions Standards* (D.S No. 38/2013),⁸ published in July 2013.

2.1 Context and Scope of this Gap Assessment of the AGIES of the Valdivia River Basin

An AGIES is created for the purpose of understanding the socio-economic impacts of a certain action or policy. The key components of an AGIES as described in D.S No. 38/2013 are an assessment of certain socio-economic conditions, impacts and risks for identified stakeholders, and a cost-benefit analysis. ARAUCO has expressed concerns regarding gaps in the AGIES for the Valdivia River Basin. An official objection to the NSCA was received by the Republic of Chile’s Third Environmental Tribunal, on 6 January 2016, after the December 2015 publication of the NSCA in the Official Gazette. ARAUCO’s official objection includes four primary objections, one of which is that there is “no identification and consideration to the effective economic and social costs that will be produced from the secondary norm of environmental quality contained in the Decree Challenged”.⁹

This objection is further elaborated:

Paragraph VII. THE AGIES DOES NOT FULFILL THE MINIMUM LEGAL REQUIREMENTS, AND DOES NOT CONSIDER THE REAL ECONOMIC AND SOCIAL IMPACT OF THE NORM.

Where there is a breach of the legal and regulatory rules that refer to the AGIES, which was developed late in the context of the process of generating the Decree Challenged and does not fulfill the minimum mandated requirements. In this way, the process has not identified or considered the effective costs and benefits of the

⁶ Leon, Jorge M. et al. *General Analysis of the Economic and Social Impact of the Valdivia River Secondary Water Quality Standard* (English Translation). N.p., 2013. Print.
⁷ Republic of Chile Ministry of Environment. *Establishes Secondary Water Quality Standards for the Valdivia River Basin* (English Translation). (2015): N.p., Print.
⁸ Republic of Chile Ministry of Environment. *Regulation on the Issue of Environmental Quality and Emissions Standards* (English Translation). N.p., 2013. Print.
⁹ Reclamación R-25-2016, Tercer Tribunal Ambiental. *Reclamación del artículo 50 de la Ley No. 19 300* (Translated by Oil & Gas Sustainability). pp 3-4. 2016. Print

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regulation, and the real economic and social impact of the secondary norm of environmental quality has not been considered.

and

CONCRETE REQUEST

1. To annul and leave without any effect the Decree 1/2015.
2. To order the Ministry of Environment to issue a new resolution to initiate a new process for the secondary environmental quality norm in the Valdivia river basin, which allows the appropriate consideration of the existing technical and scientific studies and to elaborate an ideal Official Draft¹⁰ for the protection of the waters in the basin.
3. Any other favourable measure to our part that the Estimated Tribunal deems necessary, with regard to this petition and its contents.¹¹

The Republic of Chile's *Environmental Framework Law* (Law No. 19,300) provides the basis for the organization of environmental laws in the Republic of Chile and the regulatory framework for environmental activity in Chile. As part of Law No. 19,300 it is written:

"Best available techniques: the more efficient, advanced phase of development of activities and exploitation methods showing the practical ability of certain techniques to prevent or reduce emissions in general and the impact on the environment and population's health. To such effect, an assessment of their economic and social impact shall be prepared, as well as of their costs and benefits, their use or production in the country and access, under reasonable conditions, thereto by the relevant party."

and

"The Ministry of the Environment shall propose, facilitate and coordinate the issuance of emission standards. To such end, it shall abide by the phases established in section 32, paragraph three, and the corresponding regulations, as required, considering the environmental conditions and characteristics proper to the area where they will be applied, making use of the best available techniques and criteria to determine the values or parameters to be complied with under the standard, where appropriate." ¹²

ARAUCO's objection, in part, is based on their assessment that there is an inadequate understanding of the costs versus benefits of the AGIES because the AGIES has gaps relative to the legal requirements in Article 15 of D.S

¹⁰ Throughout this report the term "Official Draft" is used as the English translation of "Anteproyecto".

¹¹ Reclamación R-25-2016, Tercer Tribunal Ambiental. Reclamación del artículo 50 de la Ley No. 19.300 (Translated by Oil & Gas Sustainability). p 6. 2016. Print.

¹² Law No 19,300: On General Basis of the Environment and Environmental Commission Organizational Law (Official Translation). N.p., 2010. Print.

No. 38/2013. A secondary objective of this assessment is to determine if best available techniques are applied. These objections are the key drivers for this gap assessment.

ARAUCO has engaged Oil & Gas Sustainability Ltd. to assess these gaps in the AGIES from three relevant perspectives:

1. Gaps relative to regulatory requirements described in Article 15 of D.S No. 38/2013;
2. Gaps relative to socio-economic impact assessment best practices; and,
3. Gaps relative to cost-benefit analysis best practices.

2.1.1 Objective

The objective of this Gap Assessment of the AGIES of the Valdivia River Basin (Gap Assessment) is to assess the completeness of the AGIES based on requirements described in D.S No. 38/2013 Article 15. A secondary objective of this Gap Assessment is to analyze the quality of the AGIES. This quality assessment is conducted through an assessment of the AGIES relative to best practices in socio-economic impact assessment and best practices for cost-benefit analysis.

2.1.2 Out of Scope

Certain elements of assessment are out of scope, these include:

- Quality of results: This Gap Assessment does not evaluate the quality of the results in the AGIES. For example, this Gap Assessment does not evaluate the quality of the present value of the monitoring and abatement costs presented in the AGIES. Any assessment of quality is based on best practices for socio-economic impact assessments and cost-benefit analysis.
- Other regulatory requirements: D.S No. 38/2013 describes several regulatory requirements for the NSCA. This Gap Assessment only evaluates the requirements as described in D.S No. 38/2013 Article 15, titled *"On the technical and economic analysis"*.
- Other studies: The creation of a secondary environmental quality standard requires extensive studies and analysis to inform regulatory decision-making. These studies are not in the scope for analysis in this Gap Assessment.
- Gap closure and monitoring: This report provides an assessment of the gaps relative to regulatory requirements and best practices. Some suggested next steps in order to address (i.e. close) identified gaps are provided in Section 7 of this Gap Assessment report. However, addressing the gaps identified and monitoring the performance of activities that close the identified gaps are not in scope.

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2.2 Methodology

Extensive research concludes that there are no known best practices for a gap assessment. Rather, there are some known general practices for gap assessments. Oil & Gas Sustainability Ltd. referenced and used general practices as outlined in *The Handbook of Work Analysis*¹³ to develop and execute the methodology of this Gap Assessment.

The methodology used for this Gap Assessment was as follows:

- Define scope and objective: The scope and objective for this work are to evaluate the completeness of the AGIES and to evaluate the quality of the AGIES relative to socio-economic impact assessment and cost-benefit analysis best practices.
- Gathering data and research: Sources of data include, but are not limited to, the AGIES itself, D.S No. 38/2013, the NSCA, the methodology cited in the AGIES (Cifuentes 2008),¹⁴ Law 19,300, in-person interviews with ARAUCO staff, and additional sources of information.
- Establish need and/or desired state: In discussions with ARAUCO it was determined that the desired state is to have the AGIES meet the requirements outlined in D.S No. 38/2013 Article 15, and best practices. This AGIES should support an NSCA that provides the maximum socio-economic benefits with the minimum costs.
- Define gap(s) relative to need and/or desired state: The gaps defined based on the desired state were therefore determined to be:
 - Gaps relative to regulatory requirements described in Article 15 of D.S No. 38/2013;
 - Gaps relative to socio-economic impact assessment best practices; and,
 - Gaps relative to cost-benefit analysis best practices.
- Evaluate gap(s): The degrees to which the regulatory requirement are met and/or best practices are used are evaluated in Sections 4-6 of this Gap Assessment, with supporting data in appendices.
- Provide solutions to closing identified gaps and monitor performance: Section 7 of this report provides some suggested next steps in terms of closing identified gaps, however this Gap Assessment is focused on identifying and analyzing gaps. Closing gaps and monitoring performance of gap closure activities is not in scope of this Gap Assessment.

¹³ Wilson, Mark A. et al. *Handbook of Work Analysis*. New York, NY: Routledge, 2012. Print.





¹⁴ Cifuentes, Luis A. *Generación de Metodología para el Desarrollo de Análisis General del Impacto Económico y Social de Normas Secundarias de Calidad de Agua*. 2008. Print.

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2.2.1 Summarizing Findings

Findings of this Gap Assessment are summarized using the symbols and terminology presented in Figure 1. Gaps compared to the requirements of D.S No. 38/2013 Article 15 are presented in Section 4. Gaps in socio-economic impact assessment relative to best practice are presented in Section 5. Gaps in cost-benefit analysis relative to best practice are presented in Section 6. For each assessment of gaps presented in Sections 4, 5, and 6, notes are also provided in appendices 1, 2, and 3.

Figure 1: Explanation of Terminology in Gap Assessment Figures

	No gaps assessed: Regulatory requirement or best practice has been met (in the case of regulatory requirements) or used (in the case of best practice). An explanation of methods and inputs has been provided.
	Some gaps assessed: Regulatory requirement or best practice has been addressed/discussed and not fully incorporated. In the case of regulatory requirements, elements of the regulatory requirement have been met without fully meeting all requirements. Selected elements of methods and inputs are provided.
	Extensive gaps assessed: Regulatory requirement not assessed. Best practice not used. Methods and inputs not provided.
	More clarity required in order to assess gaps: Unable to determine if regulatory requirement is met due to lack of clarity in methodology and inputs.

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3. REGULATORY REQUIREMENTS

The Political Constitution of the Republic of Chile establishes the state's duty to enforce the right of all persons to live in a pollution-free environment, and to protect the preservation of nature. Law No. 19,300 defines the instruments of environmental management as part of the framework for environmental activity in Chile. Among these instruments are the instruments used to address, prevent or remedy environmental pollution, such as environmental quality standards, emission standards and prevention and decontamination plans. Based on Law No. 19,300, the Republic of Chile Ministry of the Environment (Ministry of Environment) has the power to issue secondary standards regarding environmental quality in order to regulate pollutants in the environment for the protection or conservation of the environment, or for the preservation of nature.

3.1 Environmental Quality Standards

Based on Law No. 19,300 the Ministry of Environment has several instruments to regulate pollution and manage Chile's natural environment. Among these instruments are environmental quality standards. There are two types of environmental quality standards that can be issued: primary and secondary environmental standards.

3.1.1 Primary and Secondary Environmental Quality Standards

Primary environmental quality standards aim to reduce the risk for the life or health of the population. Due to the connections with the life and health of populations, the Ministry of Health is involved in the creation and issuance of these primary environmental quality standards. Primary environment standards apply to the entire territory of the Republic of Chile. As noted in the *Regulation on the Issue of Environmental Quality and Emissions Standards* (D.S No. 38/2013):

*"Primary environmental quality standards are those that establish the permissible values of concentrations and periods, maximum or minimum, of elements, compounds, substances, chemical or biological derivatives, energy, radiation, vibration, noise, or combination thereof, whose presence or absence in the environment could pose a risk for the life or health of the population, defining the levels that give rise to an emergency situation."*¹⁵

Secondary environmental quality standards aim to reduce the risk in the protection or conservation of the environment, or the preservation of nature. Secondary environmental quality standards must include a geographical scope of application, which may be the entire territory of the Republic of Chile or a part of the country. Secondary environmental quality standards may be done in collaboration with other ministries on a case-to-case basis. As noted in D.S No. 38/2013:

¹⁵ Republic of Chile Ministry of Environment. *Regulation on the Issue of Environmental Quality and Emissions Standards (English Translation)*. N.p., 2013. Print. Article 2.

“Secondary environmental quality standards are those that establish the permissible values of concentrations and periods, maximum or minimum, of substances, elements, energy, or combination thereof, whose presence or absence in the environment could pose a risk for the protection or conservation of the environment, or the preservation of nature.”¹⁶

3.2 Secondary Water Quality Standards for the Valdivia River Basin

The *Secondary Water Quality Standard for the Valdivia River Basin* (NSCA) was enacted on 14 January 2015 and finalized through Memorandum No. 210/2013, dated December 2013. This NSCA is a Secondary Water Quality Standard for the territory of the Valdivia River Basin, and has been established to preserve the hydric ecosystems and eco-systemic services through the maintenance and improvement of the water quality of the Valdivia River Basin.

As noted in the NSCA:

“This decree sets forth the secondary standards of environmental quality for the protection of the surface continental waters of the basin of the Valdivia River. The purpose of said standards is to conserve or preserve the hydric ecosystems and their eco-systemic services, by maintaining or improving the quality of the basin’s waters.”¹⁷

and

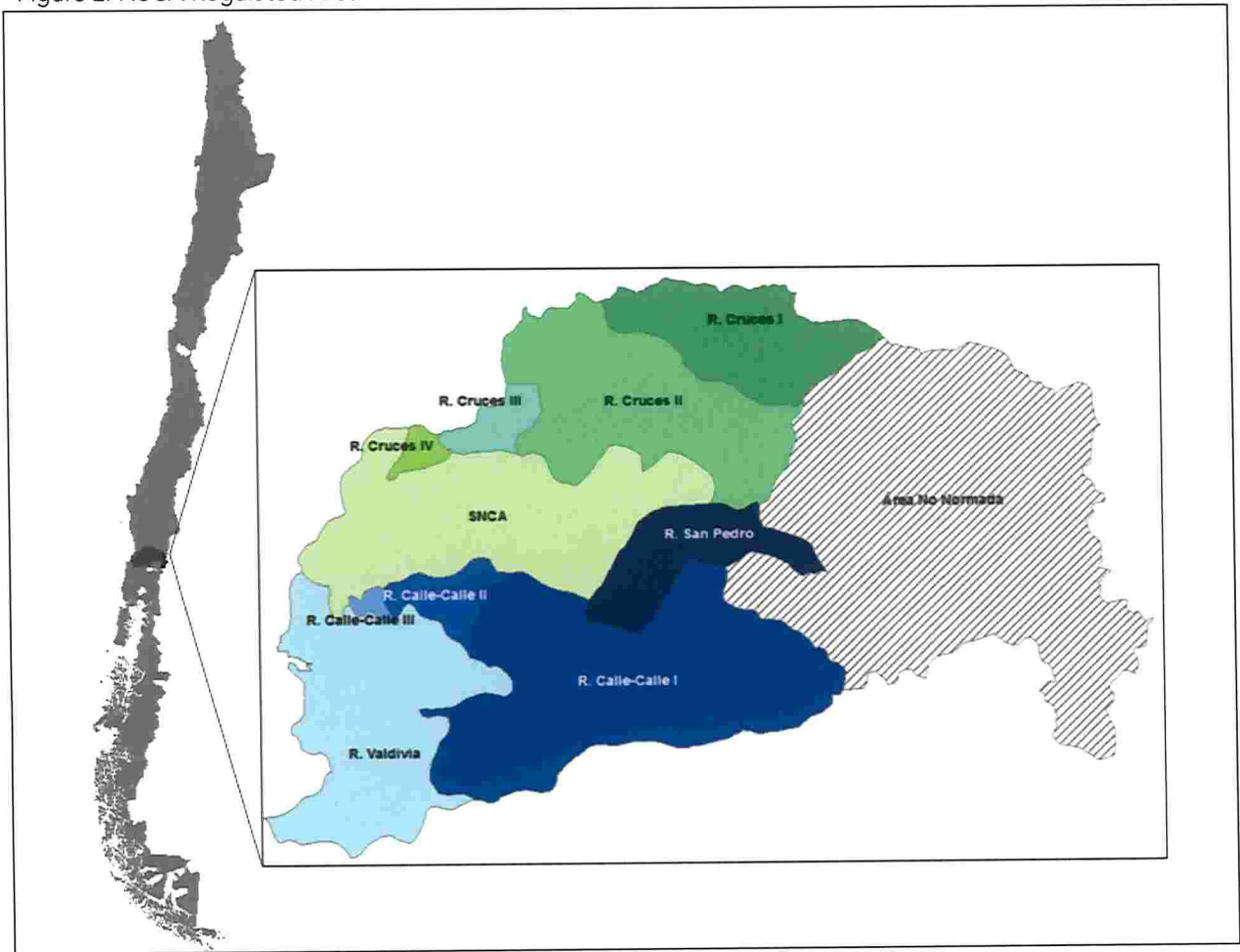
“The territorial scope of application of these standards corresponds to the basin of the Valdivia River, located in La Araucanía, Ninth Region, and in Los Ríos, Fourteenth Region.”¹⁸

The NSCA’s geographic extent of the regulated areas in the Valdivia River Basin’s waters is shown in Figure 2.

¹⁶ Republic of Chile Ministry of Environment. *Regulation on the Issue of Environmental Quality and Emissions Standards (English Translation)*. N.p., 2013. Print. Article 3.
¹⁷ Republic of Chile Ministry of Environment. *Establishes Secondary Water Quality Standards for the Valdivia River Basin (English Translation)*. (2015): N.p., Print. Article 1.
¹⁸ Republic of Chile Ministry of Environment. *Establishes Secondary Water Quality Standards for the Valdivia River Basin (English Translation)*. (2015): N.p., Print. Article 2.

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Figure 2: NSCA Regulated Area¹⁹



3.2.1 NSCA Environmental Quality Levels and Monitoring Locations

In order to monitor and enforce compliance of NSCA's Secondary Water Quality Standards, ten monitoring areas have been established for the Valdivia River Basin, as described in Table 1.

¹⁹ Republic of Chile Ministry of Environment. *Regulation on the Issue of Environmental Quality and Emissions Standards (English Translation)*. N.p., 2013. Print.

Table 1: NSCA Monitoring Areas²⁰

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Waterway	Monitoring Area	Limits of the Monitoring Area	UTM Coordinates	
			N	E
Cruces River	RCI	From: Source of the Cruces river	5.634.252	733.256
		To: Cruces River in Loncoche	5.639.597	705.228
Cruces River	RCII	From: Cruces River in Loncoche	5.639.597	705.228
		To: Cruces River, downstream Rucaco	5.621.312	680.163
Cruces River	RCIII	From: Cruces River, downstream Rucaco	5.621.312	680.163
		To: Cruces River in Cahuincura	5.620.787	667.634
Cruces River	RCIV	From: Cruces River in Cahuincura	5.620.787	667.634
		To: Cruces River in San Luis de Alba	5.614.447	658.822
Cruces River	SNCA	From: Cruces River in San Luis de Alba	5.614.447	658.822
		To: Confluence of the Cruces and the Calle Calle Rivers	5.590.372	648.860
Valdivia River	RV	From: Front of Yachting Club, upstream confluence of the Cruces and the Calle Calle Rivers	5.590.480	649.650
		To: Valdivia river at the mouth in Corral Bay	5.585.128	638.570
San Pedro River	RSP	From: Drainage of Riñihue Lake	5.595.015	716.287
		To: San Pedro River upstream, confluence of Quinchilca River	5.586.045	691.925
Calle Calle River	RCCI	From: San Pedro River upstream, confluence of Quinchilca River	5.586.045	691.925
		To: Calle Calle River in the San Javier Pool	5.592.061	674.754
Calle Calle River	RCCII	From: Calle Calle River to San Javier Pool	5.592.061	674.754
		To: Calle Calle River in Soto Slope	5.593.991	656.144
Calle Calle River	RCCIII	From: Calle Calle River in Soto Slope	5.593.991	656.144
		To: From of Yachting Club upstream confluence of the Cruces River and the source of Valdivia River	5.590.480	649.650

²⁰ Republic of Chile Ministry of Environment. Establishes Secondary Water Quality Standards for the Valdivia River Basin (English Translation). N.p., 2015. Print. Article 4 "Monitoring Areas".

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3.3 Regulatory Requirements for the AGIES

As noted in the *Regulation on the Issue of Environmental Quality and Emissions Standards* (D.S No. 38/2013) there is a requirement to include a technical and economic analysis of the NSCA, “[t]he procedure for issuing quality and emissions standards will include... a technical and economic analysis...”.²¹ D.S No. 38/2013 describes the requirements for the creation of a technical and economic analysis in Article 15, as follows:

“The Ministry should conduct a technical analysis that identifies and quantifies, as applicable, any risks for the population, ecosystems or species that are directly affected or protected, and a general analysis of the social and economic impact, taking into account the current situation and the situation with the standard’s Official Draft. Both analyses will be completed within the term for elaborating the Official Draft.

Particularly, the general analysis of the economic and social impact must evaluate the costs involved in the performance of the quality or emissions standard’s Official Draft for the population, for the owners of the regulated sources or activities, and for the State as the entity accountable for enforcing the same. Additionally, this study should identify and, as applicable, quantify the benefits involved in the performance of said standards for the population, for the owners of the regulated sources or activities, and for the State.”²²

The requirements of the AGIES as described in D.S No. 38/2013 Article 15 can be separated into 14 discrete requirements. There are 13 of the 14 required criteria relevant to AGIES, these are listed and evaluated later in this Gap Assessment (refer to Figure 4, Section 4).

3.4 Content and Methods in the AGIES

The AGIES was scoped, researched, analyzed and published by the Ministry of Environment. A final version of the AGIES was included in the public file in December 2013 and comprised of 5 parts:

- A description of the area of study,
- A summary with the main aspects of the assessed regulation,
- A methodological chapter,
- Results, and
- Conclusions of the analysis.

The primary purpose of the AGIES is to:

²¹ Republic of Chile Ministry of Environment. *Regulation on the Issue of Environmental Quality and Emissions Standards* (English Translation). N.p., 2013. Print. Article 6.

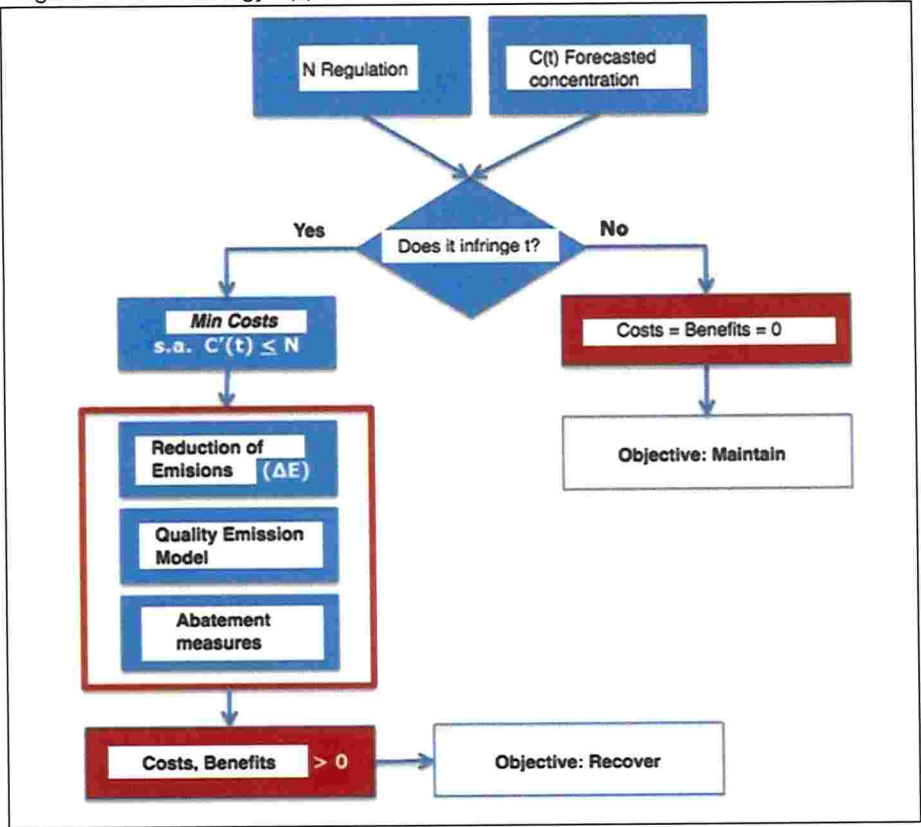
²² Republic of Chile Ministry of Environment. *Regulation on the Issue of Environmental Quality and Emissions Standards* (English Translation). N.p., 2013. Print. Article 15.

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“...estimate of the general impact of the proposed NSCA over the basin of the Valdivia River, this AGIES estimated the costs that would result from the implementation of the preliminary project for the various stakeholders involved (society, privates and State) and the benefits that would be obtained from the maintenance and/or recovery of certain eco-systemic services.”²³

The methodology used in the AGIES consists of reviewing the general background information on the Valdivia River Basin, simulating compliance with the NSCA in the evaluation period, and identifying the Valdivia River Basin’s eco-systemic services. Using this evaluation, the Ministry of Environment then estimates the economic and social impacts associated with implementing effluent abatement and monitoring activities needed to achieve the estimated reduction goals. This analysis has been done using a methodology illustrated in Figure 3.

Figure 3: Methodology Applied to the AGIES Evaluation²⁴



²³ León, Jorge M. et al. General Analysis of the Economic and Social Impact of the Valdivia River Secondary Water Quality Standard (English Translation). N.p., 2013. Print.

²⁴ León, Jorge M. et al. General Analysis of the Economic and Social Impact of the Valdivia River Secondary Water Quality Standard (English Translation). N.p., 2013. Print. Figure 3.

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If the forecasted concentration (C(t)) of the regulated parameter is below the regulatory limit over time, then no marginal costs and no marginal benefits are required. The objective is to maintain the current status.










However, if the forecasted concentration of the regulated parameter is above the regulatory limit over time then the minimum cost, or higher, of abatement must be used to reduce emissions of the regulated parameter to below the level of the regulatory limit. Additionally, requirements to model the emissions and bring emissions to regulated standards are triggered. Both costs and benefits are expected to be greater than zero, however there are no requirements that the total benefit over time must be higher than the total costs over time.

The costs considered in the AGIES are associated with abatement measures for non-compliant areas and monitoring of regulated parameters in all areas. The benefits that society obtains from the application of the NSCA are implied to be the social wellbeing, as well as the development of productive and recreational activities, in the Valdivia River Basin.

4. GAP ASSESSMENT OF REGULATORY REQUIREMENTS

There are 14 regulatory requirements described in Article 15 of D.S No. 38/2013,²⁵ and 13 of these regulated required criteria are relevant to the AGIES. Figure 4 provides a description of each of these required criteria and assesses the gaps of the AGIES against these requirements. Of the 13 relevant required criteria, one (7.7%) required criterion was fully met, two (15.4%) of the required criteria were partially met, four (30.8%) required criteria displayed significant gaps relative to AGIES requirements. It was not possible to determine if six (46.2%) of the required criteria were met because the AGIES makes critical methodological assumptions that make this evaluation unfeasible. Appendix 1 provides a more detailed assessment of the results presented in Figure 4.













Figure 4: Summary of the Regulatory Gap Assessment of the AGIES

Required Criteria	Gap	Notes
1. Identifies and quantifies, as applicable, any risks to the ecosystems or species that are directly affected or protected.		Risks to aquatic biota and ecosystem were identified, but not quantified.
2. Evaluates the costs prior to the application of the quality or emissions standard for the population.		Description of local conditions provided, but costs prior to the application of the quality or emissions standard were not assessed.
3. Evaluates the costs prior to the application of the quality or emissions standard for the owners of the sources or activities to be regulated.		Costs prior to the application of the quality or emissions standard for regulated owners not assessed.
4. Evaluates the costs prior to the application of the quality or emissions standard for the State.		All costs presented as future incremental costs.
5. Evaluates the costs involved in the performance of the quality or emissions standard for the population.		Costs involved in the performance of the quality or emissions standard for the population not assessed.
Legend		
 No gaps assessed		Extensive gaps assessed
 Some gaps assessed		More clarity required in order to assess gaps

²⁵ Republic of Chile Ministry of Environment. *Regulation on the Issue of Environmental Quality and Emissions Standards (English Translation)*. N.p., 2013. Print. Article 15.

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Figure 4 (continued): Summary of the Regulatory Gap Assessment of the AGIES

Required Criteria	Gap	Notes
6. Evaluates the costs involved in the performance of the quality or emissions standard for the owners of the regulated sources or activities.		Costs for monitoring and abatement quantified in present value. Delineation between State, owner, and other costs were not provided.
7. Evaluates the costs involved in the performance of the quality or emissions standard for the State as the entity accountable for enforcing the same.		State costs were defined through monitoring costs.
8. Identifies and, as applicable, quantifies the benefits prior to the application of the quality or emissions standard for the population.		Two critical decisions were made in the AGIES that cause required criteria 9-14 to be in need of additional clarity before these items can be evaluated.
9. Identifies and, as applicable, quantifies the benefits prior to the application of the quality or emissions standard for the owners of the source or activities to be regulated.		I) Due to the complexity for the calculation of the marginal benefit, a decision was made in the AGIES to identify and list benefits of implementing the standard. However, <u>costs were quantified in marginal present value based on the reduction of the regulated parameters, using specific monitoring and abatement measures</u> . Costs and benefits were measured in a way that they cannot be compared to one another.
10. Identifies and, as applicable, quantifies the benefits prior to the application of the quality or emissions standard for the State.		
11. Identifies and, as applicable, quantifies the benefits involved in the performance of the quality or emissions standards for the population.		
12. Identifies and, as applicable, quantifies the benefits involved in the performance of the quality or emissions standards for the owners of the regulated sources or activities.		II) The AGIES assumed that ecosystems services contribute to social wellbeing and allow for the development "of <u>countless</u> productive and recreational activities" in the various territories. ²⁶
13. Identifies and, as applicable, quantifies the benefits involved in the performance of the quality or emissions standards for the State.		
Legend		
 No gaps assessed	 Extensive gaps assessed	
 Some gaps assessed	 More clarity required in order to assess gaps	

²⁶ Emphasis added.

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4.1 Summary and Discussion

There are 13 relevant required criteria for assessment based on the regulatory requirements described in Article 15 of D.S No. 38/2013, "On the technical and economic analysis". Only one of the required criteria for assessment was fully met based on the gap assessment presented in Figure 5.²⁷ This requirement was met through the AGIES articulating the costs of performance of the NSCA for the State, by estimating costs for the abatement measures and monitoring program for regulated parameters in the Valdivia River Basin.

Additionally, two required criteria for assessment based on the regulatory requirements described in Article 15 of D.S No. 38/2013, "On the technical and economic analysis" were partially met.²⁸ Costs for monitoring and abatement were quantified in marginal present value, but delineation between State, owner, and other costs were not provided. The risks to the ecosystems were identified in the detrimental effects of certain parameters for the aquatic biota, however these were not quantified for the species listed.

Article 15 of D.S No. 38/2013, lists requirements for an assessment of the NSCA's benefits. These benefits cannot be assessed in the Gap Analysis.²⁹ Two key assumptions in the AGIES require additional clarity before these items can be evaluated. As noted in the AGIES:

"...due to the complexity for the calculation of the marginal benefit related to the variation of the flow of the eco-systemic services related to a certain water quality, a decision was made to identify the regulation's benefits associated to its implementation and a quantification of the emission reduction for each of the regulated parameters, resulting from specific abatement measures".

and

*"...eco-systemic functions, which are structured over the basis of physical, chemical and biological components of the ecosystems and their interactions. These eco-systemic services contribute to social wellbeing and allow for the development of countless productive and recreational activities in the various territories".*³⁰

These assumptions that the benefits are too complex to calculate and that the ecosystem services provide countless, i.e. unquantifiable, benefits means that the AGIES only listed benefits, while costs were provided in marginal presented value. Based on D.S No. 38/2013, benefits are required to be identified and, as applicable, quantified in the AGIES. The methodology cited in the AGIES³¹ includes a structure for estimating, classifying and quantifying the benefits of a secondary environmental standard. Marginal costs for monitoring and abatement

²⁷ Regulatory required criteria 7 in Figure 4.

²⁸ Regulatory required criteria 1, 6 in Figure 4.

²⁹ Regulatory required criteria 8-13 in Figure 4.

³⁰ León, Jorge M. et al. *General Analysis of the Economic and Social Impact of the Valdivia River Secondary Water Quality Standard* (English Translation). pp 5-6., 2013. Print.

³¹ Cifuentes, Luis A. *Generación de Metodología para el Desarrollo de Análisis General del Impacto Económico y Social de Normas Secundarias de Calidad de Agua*. 2008. Print.

are quantified in present value and benefits are simply listed, therefore cost and benefit cannot be compared to one another in a cost-benefit analysis, and it was not possible to determine if six of the 14 required criteria in D.S No. 38/2013 Article 15 have been assessed in the AGIES.









There are four required criteria for the AGIES, based on the regulatory requirements described in Article 15 of D.S No. 38/2013, which contain extensive gaps.³² These requirements that contain extensive gaps are related to the risks and costs to non-State actors, both prior to and after the implementation of the NSCA, in the AGIES. Additionally, there was no discussion on the costs to the owners of the regulated sources prior to the application of the NSCA. The AGIES also noted that current monitoring is a State cost, however, current costs of monitoring are not clearly articulated and assessed, rather the costs that were articulated in the AGIES are incremental costs for additional monitoring.

³² Regulatory required criteria 2-5 in Figure 4.

5. GAP ASSESSMENT OF SOCIO-ECONOMIC IMPACT ASSESSMENT BEST PRACTICES













There are 16 best practices for socio-economic impact assessment described in *A Community Guide to Social Impact Assessment*.³³ Of these 16 best practices only 13 were relevant to the scope of this Gap Assessment of the AGIES. Figure 5 provides a description of these best practices and assesses the gaps. Of the 13 relevant best practices, three best practices (23.1%) were used, three best practices (23.1%) were used with some gaps, while extensive gaps have been assessed in use of seven (53.8%) of the socio-economic impact assessment best practices. Appendix 2 provides a more detailed assessment of the results presented in Figure 5.

Figure 5: Best Practices in Socio-economic Impact Assessment Gap Assessment of the AGIES

Best Practice	Gap	Notes
1. Describe the proposed action.		Proposed action has been described as the establishment of concentration limits for various parameters, a monitoring program, and abatement measures.
2. Do a social profile.		Valdivia River Basin social profile was not provided (i.e. no descriptions of indigenous populations, cultural activities, demographics, etc.).
3. Identify stakeholders.		Stakeholders were listed in the AGIES, and both private companies and the State are further categorized. However, there was no identification of the population/local society stakeholder or a breakdown of key individuals.
4. Determine region or zone of influence.		The AGIES was focused on the Valdivia River Basin, and the area is described.
Legend		
	No gaps assessed	 Extensive gaps assessed
	Some gaps assessed	 More clarity required in order to assess gaps






³³ Burdge, Rabel J. *A Community Guide to Social Impact Assessment*. Fourth Ed. Huntsville, Texas: Social Ecology Press, 2015. Print.

Figure 5 (continued): Best Practices in Socio-economic Impact Assessment Gap Assessment of the AGIES

5. Determine methods and measurements.		The proposed methods and measurements to complete the AGIES were outlined in the referenced material. The measurements for the monitoring program were also identified and divided by parameter and monitoring area in the AGIES.
6. Be aware of alternatives.		Unable to find any alternative activities proposed.
7. Identify population impacts.		Unable to find impacts assessment for the population, such as employment, access to infrastructure, transportation, education, etc.
8. Identify community / institutional impacts		Some institutional impacts were identified in the form of the monitoring costs to the State. Community level impacts were not identified.
9. Identify community in transition impacts ³⁴		Communities in transition were not identified in the AGIES, and no specific impacts to these communities were assessed.
10. Identify family level impacts		Unable to find specific impacts listed at the family level, such as employment, access to healthcare, education, childcare, life expectancy, etc.
11. Identify community infrastructure needs		Unable to find specific impacts to community infrastructure listed, such as the effects on local sewer/waste management plants, drinking water treatment facilities, availability of education centers, hospitals, etc.
12. Determine significance of impacts		Unable to find any system for ranking the significance of the impacts to stakeholder.
Legend		
	No gaps assessed	 Extensive gaps assessed
	Some gaps assessed	 More clarity required in order to assess gaps

³⁴ In his journal article (Burdge, Rabel J. *The practice of social impact assessment background*, Impact Assessment and Project Appraisal, 21:2, p 84-88, 2003. Print) Burdge notes that most communities are communities in transition and that “communities in transition refers to alterations in power with the arrival of different groups and agendas”

Figure 5 (continued): Best Practices in Socio-economic Impact Assessment Gap Assessment of the AGIES

13. Plan mitigation, monitoring and social impact management measures		A monitoring program was considered in the AGIES. The mitigation plan, which in this case refers to the abatement measures, was not described (i.e. technologies proposed, effluent reduction targets to achieve limits, or the location of application).	
Legend			
	No gaps assessed		Extensive gaps assessed
	Some gaps assessed		More clarity required in order to assess gaps

5.1 Summary and Discussion

There are 16 best practices for socio-economic impact assessment described in *A Community Guide to Social Impact Assessment*³⁵ and 13 of these 16 best practices are relevant to the AGIES. Three of the 13 relevant best practices were used in the AGIES. The AGIES described the proposed action,³⁶ which is the application of the NSCA that establishes the concentration limits for various parameters, followed by considerations for the monitoring of the parameters at various monitoring stations, and includes the abatement measures. The zone/region of influence is articulated as the waters of the Valdivia River Basin, with maps and monitoring locations established in the AGIES.³⁷ Methods and measurements were explained.³⁸ The proposed methods to complete the AGIES were outlined in the referenced material, and cited.³⁹ The measurements for the monitoring program were also considered and divided by parameter and monitoring area in the AGIES.

Three of the 13 relevant best practices for socio-economic impact assessment were used with some gaps. Stakeholders were identified, with some gaps in the description. Stakeholders were listed in the AGIES, and both private companies and the State are subcategorized. *A Community Guide to Social Impact Assessment* provides guidance to identify key individuals and/or roles, along with key institutions within the stakeholder groups, since this level of specificity is not provided in the AGIES; the best practice to “identify stakeholders” was only partially used.⁴⁰ Community and institutional impacts have been partially identified through quantifying the costs of monitoring for the State. However, community level impacts of the application of the NSCA were not identified.⁴¹

³⁵ Burdge, Rabel J. *A Community Guide to Social Impact Assessment*. Fourth Edi. Huntsville, Texas: Social Ecology Press, 2015. Print.
³⁶ Best practice 1 in Figure 5.
³⁷ Best practice 4 in Figure 5.
³⁸ Best practice 5 in Figure 5.
³⁹ Cifuentes, Luis A. *Generación de Metodología para el Desarrollo de Analisis General del Impacto Economico y Social de Normas Secundarias de Calidad de Agua*. 2008. Print.
⁴⁰ Best practice 3 in Figure 5.
⁴¹ Best practice 8 in Figure 5.

Monitoring programs were considered, however abatement measures such as proposed technologies applied at relevant facilities were not described, and social impact management measures have not been articulated.⁴²










There were significant gaps in the use of seven of the 13 relevant best practices for socio-economic impact assessment. Social profiles of the population have not been provided, which are relevant in the context of the NSCA since indigenous populations, industrial and farming activity, academic institutions and both rural and urban populations all exist within the identified zone/region of influence. Alternatives to the NSCA were not proposed and explored. Communities in transition were not identified and impacts to such communities are not assessed. Family level impacts have not been identified and assessed. There are no specific impacts to community infrastructure listed, such as the effects on local sewer/waste management plants, drinking water treatment facilities, availability of education centers, hospitals, etc. A method to explore the significance of different impacts was not provided and therefore an evaluation of the significance of different impacts was not conducted.⁴³

⁴² Best practice 13 in Figure 5.
⁴³ Best practice 2, 6, 7, 9, 10, 11, and 12 in Figure 5.

6. GAP ASSESSMENT OF COST-BENEFIT ANALYSIS BEST PRACTICES

There are 10 best practices for cost-benefit analysis (CBA) described in *Cost-Benefit Analysis: A practical guide*.⁴⁴ Figure 6 provides a description of each of these best practices and assesses the gaps against the AGIES. Of the 10 best practices, two (20%) were used and three (30%) best practices were used with some gaps. Extensive gaps have been found in the use of five (50%) of these cost-benefit analysis best practices. Appendix 3 provides a more detailed assessment of the results presented in Figure 6.

Figure 6: Best Practices in Cost-Benefit Analysis Gap Assessment of the AGIES.

Criteria	Gap	Notes
1. Define the decision to be guided by the CBA.		This AGIES was performed in order to estimate the impact of the proposed NSCA over the Valdivia River Basin, and to guide the decision making process in its later stages.
2. Define the people whose point of view is to be applied.		The AGIES was performed by the Environmental Economy Department of the Ministry of Environmental Affairs. The point of view applied in the AGIES is that of the Republic of Chile.
3. Decide criteria and parameters.		The parameters for costs and benefits have been proposed in the methodology section of the AGIES. Criteria were defined, however the way criteria evaluation can/will be applied is not clearly defined.
4. Calculate incremental benefits.		Unable to find a calculation of the incremental benefits of the proposed NSCA in the AGIES.
5. Calculate incremental costs.		The incremental costs for monitoring programs were identified, along with abatement costs. The calculations for both of these costs have not been provided in the AGIES.
Legend		
	No gaps assessed	 Extensive gaps assessed
	Some gaps assessed	 Requires more clarity

⁴⁴ Snell, Michael. *Cost-Benefit Analysis: A Practical Guide*. Second Edi, London, England: Thomas Telford Limited, 2011. Print.